



Blueprint “New Skills Agenda Steel”: Industry-driven sustainable European Steel Skills Agenda and Strategy (ESSA)

Sector Skills Matrix Report

Deliverable D4.3

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Executive Summary

This report serves both as a rationalisation of and a guide to the ESSA Sector Skills Matrix (D.4.4).

The Sector Skills Matrix (SSM) is a systematic attempt to identify steel-sector relevant occupational qualification programmes in five European countries with a significant steel industry. The Matrix's main function is to provide an assessment of each occupational qualification programme in terms of adequacy of current transversal skills provision. Additionally, by taking ESSA research on future skill needs in the steel sector into account, the Matrix is also able to provide an assessment of current and future transversal skills gaps for each qualification programme. In doing so, the Matrix is a valuable tool that can help to structure future efforts to improve transversal skills provision, which are widely seen as critical in the context of Industry 4.0 and digitalisation.

The Matrix also provides valuable links to different ESSA work packages. It creates connections between qualification programmes at the national VET systems level and industry-specific jobs that are the focus of ESSA Work Package 3. Furthermore, the skills gaps analysis can inform ESSA Work Package 5 that is concerned with developing sectoral and regional strategies to meet future skills needs of the steel industry in Europe and Work Package 6 that is concerned with improving training provisions for the sector.

The standardised format of the Matrix crucially also affords a range of comparisons of occupational qualification programmes within or beyond different VET systems that might aide cross-country learning. This will hopefully contribute to the identification of best practices and might spur innovations across countries and their respective VET systems.

While the Matrix itself is a separate deliverable (D4.4), this report provides the context required to understand how the Matrix has been constructed, what it can and cannot do and how to use it. Section 1 sets out the rationale for the Matrix in light of the ESSA project proposal and explains some of the terminology used throughout the report. Section 2 clarifies the intended capabilities and functions of Sector Skills Matrix and identifies a range of potential users. Section 3 provides a description of the Matrix content, including an explanation of the overall design choices and definitions of the categories along the horizontal and vertical axes of the Matrix. It also attempts to clarify a range of methodological issues related to the Matrix design. Sections 4 and 5 require further input from ESSA stakeholders before they can be completed. Section 4 will provide a skills gaps analysis related to current and future needs within the steel industries of the five case study countries. The findings ought to inform a set of recommendations at regional, national and European level of how to prepare the steel industry for the current and future demands of digitalisation and Industry 4.0. Section 5 will conclude the report.

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1 Description and Interpretation of Deliverable 4.3

1.1 Overview and rationale

In line with the ESSA Project Proposal, this report constitutes Deliverable 4.3 which takes the form of a Sector Skills Matrix (SSM) Report. The Report will set out:

- Interpretation of Deliverable and related Tasks in light of available VET system information in case study countries
- anticipated functions and users of the SSM
- a descriptive guide for users including methodological guidance
- Findings¹ in the form of a transversal skills gap analysis as well as continental and country-level recommendations

The SSM itself constitutes the separate albeit closely related ESSA Deliverable 4.4. and takes the form of an Excel database.

1.2 Interpretation of Deliverables and the related Tasks

The ESSA project proposal prescribes Deliverable 4.3 to take the form of a report and describes the content as being chiefly concerned with the occupation and skills matrix. This Deliverable is linked to a range of sub-tasks that constitute Task 4.3: Development of European sector skills Vocational Education and Training (VET) framework.

Task 4.3 is described as follows: ‘The results of Tasks 4.1 and 4.2 will inform the development of an occupation led skills-set framework for the sector. The framework will be utilised to:

- establish national VET benchmarks for current skills provision for occupations critical to the steel industry;
- utilise data from WP2 and WP3 to strategize for meeting future skill needs through national VET provision and;
- where appropriate correlate occupation skill-sets with cross-European programmes and standards frameworks.’

The ESSA project proposal further prescribes the purposes of the SSM in two sub-tasks:

Task 4.3.1: Develop matrix of occupations and skills cross-tabulated with national VET system provision for identification of current and future skill gaps and needs;

Task 4.3.2: Cross-reference matrix contents with cross-European programmes and standard frameworks for identification of where such programmes can be exploited

The two tasks essentially provide design-prescription and the Matrix design follows these closely. In general terms, the vertical axis of the Matrix will list the most important steel sector-relevant occupational qualification programmes (OQPs), while the horizontal axis

¹ These can only be reported after Validation and Evaluation workshops that take place later in 2021 and early 2022.

needs to afford cross-tabulation with a range of skills categories that are part of these occupational qualification programmes to establish, first, the extent to which OQPs cover certain skills and second, allow to identify gaps.

It is worth clarifying the terminology from the start: we follow the ESCO definition of occupation, which describes an occupation as ‘a grouping of jobs involving similar tasks and which require a similar skills set’.² By Occupational Qualification Programmes (OQPs) we mean training cycles that allow those who complete them successfully to be formally recognised as being able to perform a particular set of jobs and tasks associated with one or a cluster of occupations.³ Some occupational qualification programmes are highly specific and lead only to one specific occupational qualification. Often, however, occupational qualification programmes are training cycles that can lead to a range or cluster of closely related occupations. For example, the German VET system offers an occupational training programme for ‘industrial electricians’, yet there is no such thing as a specific occupation called ‘industrial electrician’ as such. Instead, there are a range of closely related electrician occupations that share large parts of the training curriculum but differ slightly due to some specialisations.⁴

With regard to ‘skills’ mentioned in the task description, the ESSA Matrix will limit itself to ‘transversal skills’ (also commonly referred to as ‘soft skills’, ‘key skills’, ‘non-occupation specific skills’ or ‘cross-sectoral skills’). This means that we will not consider so-called occupation-specific technical skills that tend to make up the bulk of skills and competences transferred in the course of occupational qualification programmes. We have several reasons for this limit:

- First, technical skills/ competences are indeed so numerous across many occupational qualification programmes that their inclusion would risk overloading the Matrix with so much information that it would become no longer useful.
- Second, the literature as well as interview and survey data obtained during the ESSA project suggest that transversal skills become increasingly relevant and important in the context of digitalisation and Industry 4.0 relative to specific technical skills (see ESSA D4.1). This might be slightly counter-intuitive given that both digitalisation and Industry 4.0 are associated with profound technological change, which one might expect to affect and change the technical skills basis of many occupational, but the most profound effects of the technological change associated with digitalisation and Industry 4.0 from a skills perspective are organisational through increased horizontal and vertical integration of processes, resulting in greater interdependence of formerly separate processes. This puts a premium on skills such as team work, process understanding, system knowledge, flexibility and so on.

² See: <https://ec.europa.eu/esco/portal/escopedia/Occupation>

³ This focus is what sets ESSA work packages 3 and 4 apart. Both consider their respective units of investigation from a steel industry perspective, but WP3 focuses on ‘jobs’ while WP4 focuses on national VET systems that, among many other functions, provide the required ‘qualifications’ for the steel industry workforce.

⁴ In the case of the industrial electrician programme, these are Industrial electrician specialising in industrial engineering [Industrieelektroniker/ Industrieelektronikerkerin -Fachrichtung Betriebstechnik], Electrician for automation technology (Elektroniker/innen für Automatisierungstechnik), and Electrician for machine and drive technology (Elektroniker für Maschinen und Antriebstechnik).

- Third, the exclusive focus on transversal skills provision is also aligned with the focus on OQPs: while curricula specifying technical skills provision for the various individual occupations that are part of an OQP tend to differ from each other due to the different technical specialisations associated with individual occupations, transversal skills provision is usually part of the shared curriculum of OQPs.

‘Benchmarking’ of current transversal skills provision of a range of steel-relevant occupational qualification programmes in the sense of enabling identification of best practices across five different VET systems is achieved by concentrating on learning outcomes associated with transversal skills. In the European VET system landscape, which is characterised by great diversity and national idiosyncrasies, the concept of learning outcomes provides one of the rare common references applied throughout the continent albeit nation-specific variations in interpreting this concept remain (e.g. Markowitsch and Plaimauer 2009, Cedefop 2017). Learning outcomes are effectively ‘statements of what a learner is expected to know, be able to do and understand at the end of a learning sequence.’ Given that they focus on the outcomes of qualification programmes and not on their actual content or the form of delivery, the concept of learning outcomes is capable of transcending the very diverse VET system landscape in Europe and therefore constitutes an excellent cross-country comparator when evaluating and comparing cross-continental occupational qualification programmes.

The SSM will thereby focus on learning outcomes that focus explicitly on transversal skills provision. This means we will not consider transversal skills that are implicitly part of learning outcomes related to technical skills. This constitutes a significant limitation of the SSM, but practical considerations make this necessary. First, it requires considerable specialist VET expertise related to a wide range of occupational qualification programmes to explicate the often implicit, unmentioned transversal elements that are part of learning outcomes that focus explicitly on technical skills. This level and depths of occupational expertise is not available within the confines of the ESSA project. Second, the implicit nature of transversal skills as part of technical learning outcomes is also likely to lead to a wide range of different interpretations which and to what extent transversal skills are really part of a technical skill, which would introduce a range of inaccuracies into the SSM. Third, it is also likely that the sheer number of implicit transversal skills would overload the SSM and reduce its practical usefulness as it mentions ‘current’ and ‘future’ skill gaps and needs. Fourth, and related to the above mentioned fact that OQPs usually only share the transversal skills provisions across the range of individual occupations makes it de-facto impossible to consider transversal skills that might be part of technical skills.

Lastly, with regard to definitions and interpretations of terms, Task 4.3.1 also makes prescriptions in terms of the time-frame related to the analysis of skills in the confines of the matrix. ‘Current’ in the context of the SSM means we look at transversal skills provisions as they are currently provided according to official curricula. In line with ESSA-wide agreement, future in the context of the SSM will refer to 2030. What is required in the future - or by 2030 - will be established through direct input from steel companies that are part of the ESSA consortium as well as by considering data gathered by other ESSA activities, most notably the ESSA forecasting tool that gathers industry perspectives on perceived future skill needs.

In sum, this report (D4.3) and the accompanying Sector Skills Matrix (D4.4) will establish national VET benchmarks based on learning outcomes related to transversal skills for steel-

sector relevant occupational qualification programmes (OQPs). The assessment of current transversal skills provision will be based on current curricula of occupational qualification programmes, while the assessment of future requirements will be based on input from other ESSA Work Packages (WP3 and WP5) and from steel industry partners.

2 Functions and Prospective Users of the Sector Skills Matrix

2.1 Introduction

In this section of the report, the wider usefulness and functionality of the Sector Skills Matrix is considered. The section starts with a short description of what kind of information the SSM captures. Based on this description, a range of potential uses for and potential user groups of the Matrix can then be anticipated.

2.2 Capabilities of Sector Skills Matrix

While a more thorough and detailed description of the actual information captured in the Matrix will be provided in Section 3 of this report, on a more general level, the Matrix is designed to capture the following information about transversal skills provision in the context of steel-production relevant occupational qualification programmes:

- i) the most steel-production relevant I-VET and C-Vet qualification programmes related to Maintenance, Melt Shop, Rolling Mills, Logistics and Quality Control in each of the five case study countries
- ii) Case-study country-specific link between occupational qualification programmes and steel-specific jobs
- iii) Direct web-links to curricula and regulations (if available) for each occupational qualification programme
- iv) Learning Outcomes concerning transversal skills
- v) Information related to national VET systems: national labels, classification numbers,
- vi) European Dimension: Compatibility/ alignment with/ use of a range of European VET tools: ECVET, Europass, ESCO, EQF)
- vii) Assessment/ Evaluation in the form of a RAG (red - amber- green) grading of:
 - a. Current TV skills provisions
 - b. future proofness of TV skills provision (in close cooperation with representatives of steel companies in the case study countries)

The Matrix is therefore designed to deliver concentrated information on a range of levels that opens up a range of possible functions.

- First, at the most basic level, the Matrix provides detailed information about a range of individual occupational qualification programmes in four different EU countries as well as in the United Kingdom. Each OQP can be considered individually and key characteristics (see ii, iii, iv, v in the list above) such as duration, level of qualification, position within national and European VET classification frameworks and transversal content can be viewed in a compact format. With regard to

transversal content, the Matrix will provide both high-level, abstracted information as well as a detailed list of all learning outcomes associated with transversal skills.

- Second, as the Matrix is a part of the ESSA research project, it is also designed to connect to other work packages. One upstream link is created by the Matrix through the connection of occupational qualification programmes with steel-sector jobs. This links the VET system-oriented WP4 with the job-oriented WP3. Creating such a link can afford wider strategic scope for the ESSA Blueprint when it comes to improving skills provisions. If certain skill requirements are very specific for individual jobs, measures might be taken at the job-level, for example through internal or external specific training measures for certain job holders in steel companies. If skills requirements are of a more systemic nature, measures might be better targeted at the VET system level through improving occupational qualification programmes as these will affect a wide range of steel-sector jobs. The Matrix also creates downstream links with other ESSA work packages. The systematic investigation of transversal skills gaps will feed directly into the overall Blueprint, developed by WP5. The Matrix will hopefully also prove useful for WP6, which is partly concerned with the development of new training tools to address skills gaps through.
- Third, the Matrix also opens up a range of angles for comparing OQPs. Three kinds of comparisons are available within each of the five national case studies.
 - Firstly, the assessment of the current adequacy of transversal skills provision in conjunction with an additional assessment of future skills needs, affords a comparison between current transversal skills provision and future skill needs. This comparison will be built into the Matrix as both RAG gradings for current and future adequacy will be displayed side-by-side in the Matrix (vi).
 - Secondly, given that OQPs are arranged according to five functional steel-production areas (Maintenance, Melt Shop, Rolling Mill, Logistics, and Quality Control) within each national section, comparisons can be performed within each functional area. In most national VET systems, two or more OQPs have been identified for each functional area. They often have different functional focuses, for example, in the area of maintenance the matrix captures OQPs focused on electrical and on mechanical aspects, but some OQPs also differ due to their education levels reflected in different gradings within national qualification frameworks. In the latter case, comparisons of transversal skills provision can reveal interesting differences between higher and lower level qualification programmes.
 - Thirdly, comparisons are also possible between OQPs in different functional areas, for example between melt-shop-focused and logistics-focused OQPs. This can be revealing and interesting as differences in transversal skills provision might reflect wider features of the national VET system. For example, in the case of pre-2021 changes that have led to the standardisation of transversal skills provisions in four areas across all OQPs in the German VET system, differences between logistics and melt-shop qualifications reflected the fact that melt-shop-related qualifications are part of the class of metal and electronics qualification in the German system and have therefore benefitted from an upgrading of transversal skills provision since 2018, while logistics qualifications have only been revised in 2021.

Similar kinds of comparisons can also be performed across the boundaries of the national VET systems. For example, one can perform detailed comparisons concerning

the provision of transversal skills for all Level 4 electrical maintenance or all Level 3 logistics qualifications across the five countries, which will reveal significant differences across the five VET systems. By broadening the view across VET system boundaries, potentially interesting gaps and blind-spots related to characteristics of the different national VET systems might become visible. Cross-system learning is also made possible as different ways of approaching transversal skills provision in one system might inspire further development and change in another one.

2.3 Potential Users

The Matrix and its information as part of the ESSA is informed by other work packages but also informs other work packages. Beyond the confines of the ESSA project, however, we anticipate at least potential usefulness of the sector skills matrix for a range of actors operating at three different levels.

- European level
 - o EU institutions concerned with skills development, research agendas and VET instrument etc.
 - o Other ESSA work packages
 - o Other, related EU-level research programmes (e.g. Sectoral Blueprints)
 - o Institutions representing social partners at European level
- National level
 - o National institutions representing social partners
 - o National VET institutions
 - o Public and private training providers
- Regional/ Company Level
 - o Regional economic development initiatives
 - o Regional VET institutions
 - o Regional training providers
 - o Steel Companies

At the European level, the Matrix might prove useful to EU institutions such as the Commission but also EU-funded research projects as well as European-level institutions representing social partners. Being part of a larger wave of sectoral blueprints, the sector skills matrix as part of the ESSA Blueprint can inform EU-level steel-sector focused strategic decision-making related to policies, research programmes and development and/ or adjustment of European VET tools. EU-level industry bodies and trade unions can use the information provided by the Matrix in similar ways or to use it to inform campaigning or lobbying efforts.

Industry bodies and trade unions operating at national levels in the various steel-producing European countries could use the Matrix to try and influence the direction of national VET systems or to develop additional training programmes in response to identified skills gaps. The Matrix, as well as other instruments developed as part of the ESSA project, can also serve as useful feedback mechanisms to national VET institutions, which in turn might adjust decisions and activities to close identified skills gaps. The Matrix might also prove to be of value to a range of training providers as identified skills gaps offer opportunities to those with the capacity and capability of closing them through the development of training offers.

Finally, at a regional level, the Matrix might prove useful to regional economic development initiatives such as the *South Wales Industrial Cluster (SWIC)*⁵ in the UK or the *Initiative Ruhrkreis*⁶ in the West of Germany. Given the industry- and sector-transcending nature of transversal skills, the matrix might inform broader regional and local initiatives for cross-sectoral transversal skills development. Also, given the fact that steel companies are often concentrated within particular regions and localities, VET institutions operating at this level might also find the Matrix useful to inform their approaches to training provisions or to underpin wider skills development campaigns. Similarly, local and regional training providers might adjust their offerings in light of skills gaps and future needs recorded in the Matrix. Individual steel companies might also utilise the Matrix findings to adjust

3 Descriptive guide for users including methodological notes

3.1 Introduction

The usefulness of the Matrix is partly determined by how well information is structured and explained within the Matrix. As the Matrix is a kind of database, there is limited scope to integrate detailed explanations within the Matrix, although the intention is to make labels and categories within the matrix as self-explanatory and intuitive as possible.

One general difficulty afflicting cross-national comparisons concerns language. The Matrix itself is predominantly constructed in English. That means all categories and any text that is part of the Matrix ‘scaffolding’ is in English. With regards to OQP labels, specific names of occupations and related steel-sector jobs, we try to use both English as well as the respective national language for each case study country.

This section of the report will focus on two aspects of the Matrix design. Firstly, an overall descriptive guide explains the overall structure of the Matrix which should help users to use the Matrix. As the design is replicated for each of the five national VET systems considered in the Matrix, the overall structure can be explained with reference to a single national section. Secondly, where appropriate and required, methodological information and explanations aiming to contextualise information will be provided. This will also include information about the various VET system sources that have been utilised. The section dealing with this aspect of the Matrix takes the form of a Frequently Asked Question documents where a range of relevant methodological questions will be raised and answered.

3.2 Structure and Content of the Sector Skills Matrix

The Sector Skills Matrix is an Excel database that has two ‘layers’: there is a ‘Master sheet’ that contains the Matrix as such and there are a number of additional sub-sheets constituting the second layer that provide more detailed, in-depth information about individual occupational qualification programmes (OQPs) in the respective case-study countries.

⁵ See: <https://www.swic.cymru/>

⁶ See: <https://i-r.de/>

3.2.1 The top layer of the Sector Skills Matrix

The top layer is effectively a large table that allows the cross-tabulation of occupational qualification programmes (OQPs) with a range of categories, including a range of skills categories. The vertical axis deals with OQPs, while the horizontal axis provides a range of categories to elucidate different aspects of the OQPs.

On the vertical axis, the different steel-sector relevant OQP are organised according to the different areas related to the steel production process as proposed by WP 3 (see D.3.X). This allows the Matrix to cover occupational qualification programmes related to the following areas: maintenance, melt-shop, rolling mill, logistics and quality control (see Table 1). The Matrix affords room to capture OQPs that are part of initial VET (I-VET) as well as continuous VET (C-VET) provisions.

Table 1: Functional Areas of Steel Production and associated types of OQPs

Steel Production Task/ Functional Areas	Captured Types of OQPs
Maintenance	Electrical Maintenance: 2 I-VET & 1 C-VET Mechanical Maintenance: 2 I-VET & 1 C-VET Electro-mechanical Maintenance: 2 I-VET & 1 C-VET Other
Melt-Shop	3 I-VET & 1 C-VET related to furnace and casting operation
Rolling Mill	3 I-VET & 1 C-VET related to mill operation
Logistics	1 I-VET
Quality Control	1 I-VET

As the Matrix captures five different VET system, the horizontal axis is effectively replicated five times and each of the resulting five identical horizontal sections is associated with a particular case study country's VET system. From left to right, the Matrix covers Germany, Poland, Italy, Spain and the UK.

Each case study country section has three separate sub-sections:

- (1) A section covering aspects of the national level.

The main function is to establish the 'identity' of OQPs and to provide some information, such as type of delivery and duration of programme that can aid cross-country comparisons of programmes. Categories in this section include:

Table 2: Categories covering national VET-system aspects

Category	Explanation
'Occupational Qualification Programme Label'	captures the formal or official label of the OQP

‘Specific Occupational Qualifications that are part of the Programme’	captures all individual occupational qualifications that are part of or covered by a specific OQP
‘Example Job Profiles related to qualification’	as an occupation qualification allows the performance of a range of jobs, this captures what kind of steel jobs are linked to a particular OQP. This information also provides a clear link to WP3 output that systematically captures all steel-production related jobs
‘Documentation of Curriculum’	if available this will provide a direct link to Internet-based documents that provide detailed information about the curriculum of a specific OQP
‘National Qualification Framework’	analogous to the European Qualification Framework, all case study countries have their own national system of grading OQPs and the national grade is recorded here
‘National Occupational Classification System’	analogous to the ISCO/ ESCO numerical classification system, many national VET systems have numerical occupational classification systems and the national classification number is recorded here
‘Duration’	captures the nominal lengths of training in months or hours related to a particular OQP
‘Type of Delivery’ [dual; WBL; SBL; SBL+]	captures how training is delivered, the four possible options here are dual (where training delivery is roughly split in half between school-based and work-based training), work-based learning (WBL, where training takes predominantly place within companies), school-based learning (SBL, where training predominantly takes place within vocational schools), and school-based learning + (SBL+, where training takes place in schools but there is a small but significant work-based learning element as well)
optional Industrie 4.0 qualifications/ modules as part of IVET programme	captures whether there are any optional modules as part of OQP that focus specifically on Industrie 4.0 aspects

(2) A section covering EU Level VET tools.

This does not only provide a link to European-level VET tools, but also reveals whether OQPs in two or more countries are comparable or not. Categories in this section include:

Table 3: Categories covering EU-Level VET tools

Category	Explanation
ISCO(International Standard Classification of Occupations) Number ⁷	captures the four-digit number at ISCO unit group level to establish whether OQPs across case study countries are comparable
ISCO Unit Group Label	this captures the ISCO unit group label associated with the 4 digit number ISCO number
EQF level	captures the level at which the OQP is classified in case the European Qualification Framework is applied in a case-study country
Europass Certification Supplement	If available, a link to web-based English-language version of the Europass certification supplement, that contains core information about occupational qualifications, is provided

(3) A section covering the evaluation of transversal skills provision.

Categories in this section are derived from the skills classification adopted by the ESSA project. This skills classification distinguishes between 5 types of ‘transversal skills. These skill types have been defined in the context of the ESSA project as follows:

Table 4: Transversal Skills Categories

Category	Explanation
Digital	Digital skills are broadly defined as the skills needed to use digital devices, communication applications, and networks to access and manage information.
Green	Green skills are those skills needed to adapt products, services and processes to climate change and the related environmental requirements and regulations (such as low carbon emission regulation).
Social	Social skills are defined as a set of individual capacities that can be manifested in consistent patterns of behaviours that enable people to cultivate their relationships at home, school and work and also in the community, and exercise their civic responsibilities.
Individual/ personal	Personal skills refer to the inner abilities or skills of an individual

⁷ The reference here is to ISCO and not to ESCO, but all the data in this context were obtained via the ESCO database. The reason is that ESCO builds directly on ISCO.

Methodological	Methodological skills are used in the process of obtaining and understanding new knowledge through thought, reflection, experience, and the senses
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To capture both current and future ‘grade’ of transversal skills provision, each of the five categories has been assigned two columns: one capturing the assessment of skills provision in relation to assessments current skill need (e.g. ‘Digital current’ or ‘Green current’, etc.) and one capturing how current skills provision matches up to anticipated skills needs by 2030 (e.g. ‘Digital 2030’ or ‘Green 2030’, etc.). To populate these fields, a RAG grading approach will be used that signals through colour-coding whether current transversal skills provision is regarded as adequate now and by 2030. In the current version of the Matrix, these fields remain empty as the assessment and evaluation process will take place in the last part of the ESSA project.

3.2.2 The second layer of the Sector Skills Matrix

The second layer of the Table consists of a number of work-sheets that re designed to capture standardised information about the transversal skills that are part of the formal training curriculum. The top four rows in each worksheet captures the following information:

Table 5: Occupational Qualification programme descriptors

Category	Explanation
OQP	Name of the occupational qualification programme
Applies to	List of the specific occupations that are part of OQP
Description	list of main tasks or short description of OQP
Based on	Link to source and, if required, more detailed description of source

The remainder of the sheet is taken up by the transversal skills grid. The skills grid is based on the skills classification adopted by the ESSA project (see ESSA WP3 output for rationale and details about the particular classification chosen, see also McKinsey Global Institute 2018). The skills classification distinguishes between 5 broad types of transversal skills and each of the broad categories has a number of sub-categories. When plotted along a horizontal and a vertical axis, the skills grid emerges:

Table 6: ESSA Transversal Skills Grid

Digital (5)		Green (5)		Social (6)		Personal (5)		Methodological (8)	
Basic digital skills		Energy Efficiency		Advanced communication and negotiation skills		Critical thinking & decision making		Basic numeracy and communication	
Advanced data analysis and mathematical skills		Circular Economy		Interpersonal skills and empathy		Personal experience		Basic data input and processing	
Cybersecurity		Environmental Issues		Leadership and managing others		Adapt to change		Advanced literacy	
Use of complex digital communication tools		Resource reuse/ recycling		Entrepreneurship and initiative taking		Work autonomously		Quantitative and statistical skills	
Advanced IT skills & Programming		Sustainability		Adaptability and continuous learning		Active listening		Complex information processing and interpretation	
				Teaching and training others				Process analysis	
								Creativity	
								Complex problem solving	

The skills grid is used to log all learning outcomes related to transversal skills for each OQP by assigning them into the most adequate box (see next section of this report for a discussion of methodological considerations in this regard).

3.3 Methodological information and explanations

3.3.1 Introduction

This section of the report tries to provide sufficient methodological information to enable others to understand the Matrix and, if desired, to add to it or to expand it independently of the ESSA project.

There are considerable challenges involved in doing cross-VET-system work in the European context. Apart from the obvious differences of using terminology in the respective national languages, national VET systems tend to have long and idiosyncratic histories and they do not lend itself easily to comparisons (see D4.1). The Matrix tries to enhance comparability by focussing on standardised aspects and features of the OQPs that are relatively similar across the five different systems. Yet, without European initiatives over the last few decades to standardise VET provisions across the continent (e.g. Markowitsch and Plaimauer 2009), it is doubtful whether a cross-national matrix could even be devised. The most important development in this regard is the centralisation of the learning outcomes concept as a standardised feature in all European VET systems (e.g. Cedefop 2017). Of course, there are still national differences when it comes to define what is meant by learning outcomes and what is included or excluded but at least there is a way to make comparisons of some sort. Learning outcomes have the advantage that they consider what those receiving education ought to have learned at the end of cycle, which liberates it somewhat from the form and content of education which differs widely across the European continent.

The arguably greatest methodological challenge concerning the Matrix is to assign the various learning outcomes of the five sets of national OQPs to the categories used by the ESSA skills classification. None of the five case study countries uses a skills classification similar to the one used by the ESSA project. One fundamental problem is that the ESSA skills classification is one-dimensional in the sense that it only considers 'skills' and does not explicitly mention other concepts such as competences, knowledge or abilities and so on. The concept of learning outcomes in contrast usually goes beyond the skills dimension and also considers knowledge and abilities. This alone already introduces a certain level of inaccuracies into the skills matrix. Related to this is another problem: while the skills concept takes centre stage in the ESSA project, this is just a minor or sub-concept in the context of other systems. The German VET system, for example, emphasises the 'ability to act' (*Handlungsfähigkeit*) and generally uses the term 'competences' to describe this. Skills (*Fähigkeiten*) are just one aspect of the more complex competency concept. Another fundamental problem is that even when the same skill terminology is used by national VET systems and by the ESSA project, there are still significant differences in the meaning of the same terms depending on who uses them.

Another significant challenge concerns the range of languages involved. Again, a recent European initiative proves to be very helpful. Thanks to the Europass initiative, most occupational qualification certificates across the case study countries are available in standardised form in English and also in French. Whenever possible, these Europass certificates are used to determine which occupational label to apply. Another helpful tool in this respect is the ESCO database, that provides detailed VET information in many languages, including all official languages in the five case-study countries.

3.3.2 Methodological Questions and Answers

As already indicated, this section will adopt the format similar to that of a Frequently Asked Question section on a website. The current list of questions has been chosen by the WP4 team but it is likely to expand further due to feedback from ESSA partners and potential user groups.

Why is the vertical axis of the Matrix structured by functional areas?

The concept of ‘functional areas’ was introduced by WP3 into the ESSA project as part of their way to structure their comprehensive mapping of steel-sector jobs. While WP3 integrated maintenance into each area such as melt-shop and rolling mill, it made sense to dis-aggregate it for the purpose of the Matrix as maintenance qualifications tend to be cross-sectoral and cross-functional (i.e. there are no steel-sector or rolling-mill specific maintenance qualifications).

While with the benefit of hindsight, it seems absolutely obvious to structure the Matrix using the functional areas, it took us a while to recognise this as the best approach. Originally, the idea was to utilise either the four-digit ISCO numbers of occupations or even start with job titles. Our growing understanding of the variety of VET systems and the variety of preferences with regard to qualifications at the company level, made it clear that such starting points would not work well. The fundamental issue is that there is too much variability across VET systems. For example, in the Spanish system, steel-production operators jobs tend to be associated with ISCO number 8121, which refers to metal processing plant operators in the context of ESCO, while this qualification was not used at all in the German steel sector. Likewise, the great variety of job titles in companies within and across case-study countries, made job titles an unsuitable category to structure the Matrix.

How were relevant OQPs chosen?

The general approach pursued in all case study countries was to combine direct information received from ESSA industrial partners with information available on the Internet.

With regard to the former, industrial partners were sent a table containing the five functional areas that the Matrix focuses on with the request to please indicate what kind of occupational qualifications staff working in those areas inside companies typically required. This approach works quite well, though given the great variety of steel producers and the equally great variety of approaches to qualifications, ideally a number of steel companies ought to be sampled. Ideally, this kind of information would have been obtained while doing fieldwork within steel production companies but due to COVID-19 restrictions, this information gathering exercise was entirely done by using emails or video calls.

Depending in part on the VET system, desk-based approaches to determining relevant OQPs are also doable and complement the direct approach involving steel companies well. In countries with dual apprenticeship system, companies tend to advertise apprenticeship places on their company websites. This approach allows for wide sampling as this information is publicly available and all that is required is to visit the websites of steel companies to see what kind of OQPs close involvement of companies.

In countries where companies are not directly involved in VET provisions, a number of approaches can be applied to gather relevant information. Job adverts from steel producers might give clues as to what sort of qualifications are required to work there. There are also a range of public- and private-sector websites that provide general VET information

and/ or career advise that may highlight qualification requirements for particular jobs or sectors. Another approach is to start by checking the ESCO database to find potential steel-related qualifications in a particular country (it is possible - with some degree of caution - to make cross-national inferences, which means if one knows steel-sector relevant qualifications in one country, one can at least check whether a similar qualification in a different system is also steel-sector relevant (the four-digit ISCO numbers utilised by ESCO are very helpful in this regard).

Why are there different quantities of OQPs considered within the different functional areas?

There are numerical differences in the number of OQPs included in each of the five functional areas of steel production. Within maintenance, six I-VET and three C-VET programmes are considered while there is just one I-VET programme included in the sections covering Logistics and Quality Control. These kinds of choices have grown relatively unplanned and organically out of the continuous development of the Matrix. The wide spread of maintenance qualification programmes, for example, is a reaction to information obtained during interviews with steel sector representative because it emerged that different companies have different preferences concerning the skills of their maintenance staff. Some companies rely predominantly on mechatronics due to their versatility, while others value the greater specialisation that comes with employing mechanics and electricians in their maintenance teams. Given that in most VET systems, the three maintenance qualifications are offered, it made sense to include all three into the Matrix. Similarly, it emerged that there tends to be less choice and variety regarding qualifications related to logistics and quality control, which is reflected in the Matrix.

Ideally, quantitative importance of qualification programmes would also be a strong consideration to make decisions about which programmes to include and exclude, but sector-specific statistics in this regard are not easily obtainable across the case-study countries, which means that this consideration has not directly influenced the Matrix design. Wherever possible, however, hints in this regard provided by steel sector interviewees (e.g. 'we mainly train process technologists for the jobs in the melt-shop') have been reflected in the Matrix.

Why are no degree-level qualification programmes included?

The main reason why no degree-level qualification programmes are included in the Matrix is that they tend to be non-standardised, which makes it impossible to draw general conclusions about skill gaps. As shown in D4.1, in the European context Universities and Colleges tend to have a great deal of autonomy in deciding VET-focussed curricula of study or dual-study programmes. This means that degrees in electrical engineering from two different Universities in the same country might be very different in scope and focus. Given that the Matrix requires standardised and generalised information to work, dual study and other degree programmes are not suitable for integration in the Matrix.

Where do the detailed information about OQPs come from?

In all case study countries, detailed information about VET programmes, in particular detailed information concerning the curricula and associated learning outcomes are made publicly available, usually by national or regional regulators or by VET providers.

The standardised national system makes finding information about programmes, their curricula and learning outcomes relatively easy. For each state-recognised OQP, detailed documentation is provided by the Federal Institute for Vocational Education and Training (BIBB). A dedicated, searchable database is integrated into the public website of the BIBB: <https://www.bibb.de/en/40.php>.

The specific pages for the occupations provide links to the full documentation of the training regulations and framework curricula. There is usually also a direct link to the certification using the Europass-format. Additionally, the historic genealogical development of the occupational qualification is part of each webpage as is information regarding further future VET options.

Poland

In Poland, detailed information for each formal occupational qualification programme is provided by different institutions. The website of the public employment service (Wortal Publicznych Służb Zatrudnienia: <https://psz.praca.gov.pl/>) provide compact information sheets for all formal occupational qualifications, including general descriptions and core task related to a variety of occupations. Detailed lists of learning outcomes, both technical and transversal, as well as curricula for most occupations are accessible via the website of the Centre for Education (Ośrodek Rozwoju Edukacji: <https://www.ore.edu.pl/>), which is the main national teacher training institution in Poland, hosts a database that lists all learning outcomes related to the majority of occupational qualifications. Other resources include a database of regulated professions in Poland, which is accessible on a government website: <https://www.zawodyregulowane.pl/>.

Italy

In Italy, the responsibility for VET is distributed among several actors (Ministries of Education and Employment, Regions and Autonomous Provinces). However, minimum standards and guidelines for IVET are defined at the national level. This makes VET provision highly standardised since minimum standards apply across the whole country. As regards the strictly vocational route (Istruzione e Formazione Professionale), the occupational profiles and standards were defined by the State-Regions standing committee that brought together the Italian Regions and Autonomous Provinces, the Ministry of Employment and the Ministry of Education. As for technically or vocationally oriented high schools (Istituti Tecnici and Istituti Professionali), the guidelines and standards for these are defined by the Ministry of Education. The Ministry of Education website offers an overview of the different routes and their main characteristics <https://miur.gov.it/web/guest/scuola-secondaria-di-secondo-grado>. Another useful resource to map and retrieve information on VET qualifications (e.g. their composition in terms of skills, knowledge and competence units) is the Atlas of Work and Qualifications https://atlantelavoro.inapp.org/atlante_repertori.php.

Spain

In Spain, the official and state-regulated curricula of qualification programmes, including learning outcomes, are described in great detail in the official state gazette (Boletín Oficial del Estado: <https://www.boe.es/>) issued by the Ministry of the Presidency, Relations with the Courts and Democratic Remembrance (el Ministerio de la Presidencia, de Relaciones con las Cortes y Memoria Democrática). These bulletins also include specifications such as minimal eligibility requirements and the minimal duration of any VET programme.

Additional information on specific programmes can also be found on the websites of the numerous VET schools that operate largely regionally.

United Kingdom

VET regulation in the UK is under the remit of the different national governments (Devolved Administrations). Furthermore, the governance of VET in the UK appears particularly complex and fragmented compared to the other ESSA case study countries, due to responsibilities being distributed between a number of actors: national Ministries, VET regulators and accreditation agencies, awarding bodies and VET providers. Particularly, it has to be noted the presence of a high number of Awarding Bodies and qualifications, which makes the system more difficult to navigate. Overall, relevant Ministries and national regulators set out the framework for a qualification to be recognised and included in the national qualification framework. However as regards content, Awarding Bodies are relatively free in shaping their qualifications. From this point of view, it seems currently hardly possible to talk about national standards in the same way these are intended in the other case study countries. Useful resources to retrieve information on qualifications offered at the national level are the regulators' websites, e.g. <https://register.ofqual.gov.uk/> (England) or <https://www.qualificationswales.org/english/qualifications/> (Wales). More detailed information about the actual contents of qualifications can be found on the Awarding Bodies' websites, like <https://www.cityandguilds.com/>, or <https://qualifications.pearson.com/en/qualifications.html>.

How were categories on the horizontal axis chosen?

As pointed out in the first section of this report, a lot of the overarching categories included in the horizontal axis of the Matrix are determined by the task-description in the ESSA proposal. Still, an element of freedom of choice has been retained. The current list of categories structuring the horizontal axis of the Matrix are the result of a lengthy matrix development process. Earlier drafts contained a far greater number of categories but they were successively reduced. The main reason for the reduction was that while some information, for example on eligibility requirements or on follow-on C-VET opportunities, were easily and readily available for one or two VET systems, the same information was unavailable in other case study countries.

In general, categories on the horizontal axis were included for three main purposes. One is to provide sufficient information about the characteristics and nature of an OQP that have a bearing on the overall assessment and evaluation of transversal skills provision. Typical examples here are information related to the duration of a OQP and also the type of training, i.e. whether it's a dual programme, school-based and so on. The shorter a programme, the less time to develop skills in depth. Similarly, pure school-based programmes will make it harder to hone skills that are ultimately applied in workplaces.

The second function of horizontal skills categories is to allow for a clear identification of an OQP. Hence the inclusion of categories such as position in national qualification frameworks, numbers or codes related to national and European classification systems. It is worth noting that linking programmes to European frameworks such as ESCO is not always straightforward. For example, there is no direct inherent link between national VET-system information and the ESCO classification of occupations in the case of Germany. In some cases, such as for industrial electricians, linking both national and European level is still

easy as ESCO might use the exact terminology resulting in a single four-digit ISCO number that then affords cross-VET-system comparisons. In other cases, it is more complicated. For example, the industrial metal occupations programme consists of five different specialist occupations that can in turn be linked to three different ESCO occupations. In contrast, the Polish national occupational classification system is inherently linked to ISCO, which means that the last four digits in the six-digit Polish classification codes are the four-digit ISCO code, which leaves little room for ambiguities.

Third, given that ESSA is just one of a number of European-level sector blueprints, the Matrix offers an implicit opportunity to at least provide the potential for an expansion beyond the steel-sector. In some sense the current Matrix already goes well beyond the steel-sector most occupations relevant for the steel sector are not steel-sector specific. In fact, steel-sector specific occupations - usually related to melting or rolling of metal are fairly rare across Europe. Given that the Matrix as such is not steel-sector specific, it can be applied to all sorts of sectors and occupations.

How do we link ESSA skills categories to different VET sector categories?

As pointed out above already, the biggest methodological challenge of the Matrix is to assign VET-sector specific learning outcomes to the transversal skills categories used across the ESSA project. One major problem is, of course, that each national VET-system has its own classification system that underpins and structures the respective national system which might or might not be compatible with the skills classification used by the ESSA project. Another major problem is that while the ESSA projects centralises the 'skills' concept while this is often just one aspect in some VET systems. For example, the German system centralises 'competences' of which skills are just one aspect.

4 Assessment of skills gap and evaluation of VET programmes

This section will report the findings of workshops involving steel industry representatives that are designed to deliver on the promise of benchmarking and evaluating the 'future-proofness' of the various I-VET and C-VET programmes included in the Matrix. These workshops are planned for the second half of 2021 and first half of 2022.

Regarding the process, a two-stage approach is envisaged. In a first stage, the five national sections will be reviewed and assessed separately by steel industry, VET experts and other relevant stakeholders in each of the five case study countries (put differently, the first stage entails five separate national workshops that involve experts from each case-study country respectively). Workshop participants have two main tasks:

1. Review the information assembled in the respective country-sections of the Matrix and check for relevance and correctness
2. Grade transversal skills provision with regard to current and future adequacy

The first task is relatively straight-forward as participants can draw directly on their expertise and knowledge of steel-relevant aspects of the national VET system. Workshop participants will review the Matrix information about their respective steel-sector relevant occupational qualification programmes gathered in the Matrix with a view to ensure relevance and correctness of the data.

The second task is more difficult as it involves benchmarking and qualitative judgements about the adequacy or sufficiency of transversal skills provisions. These judgements are eminently subjective and based on workshop participants' own understanding what kind of skills and what kind of proficiency levels are required, currently and in the future. To aide workshop participants and to standardise the judgement process to some degree, the ESSA conveners will integrate research conducted within and beyond the ESSA project on current and future skills needs in the context of digitalisation and Industry 4.0. and integrate the results into the existing transversal skills grid. This means that based on research each position (or each field) in the skills grid will be graded using a three-point scale involving colour-coding⁸ to indicate which transversal skills particularly important in the context of digitalisation and Industry 4.0. The colour-coding is then applied to the skills grids containing the respective transversal learning outcomes of all the occupational qualification programmes included in any national section of the Matrix.

Workshop participants will be asked to review the breadth and depth of transversal skills provisions for each occupational qualification programme and make judgements concerning their current adequacy or sufficiency with regard to the different skills categories that constitute the transversal skills grid of the Matrix (see Section 3.2.2 of this report).

5 Recommendations and Conclusions

This section will summarise the findings of the five national and the European workshops and, if possible, develop a set of European-level and national level recommendations and approaches that might help to close skills gaps.

⁸ E.g. green = crucial/ essential; yellow = very important; red = important or similar.

Literature (Subtitles)

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